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SOLUBLE OILS AS DESTROYERS OF SAN JOSE SCALE.

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Some manufacturers have industriously exploited the merits of various preparations of oil as San Jose Scale destroyers during the past two or three years. These are so prepared that they readily mix with water and, owing to the ease and readiness with which they can be used, they especially commend themselves to the small orchardist and the owner of a few trees on a city lot, who does not wish to go to the trouble of making the lime-sulfur wash.

Some of the most widely advertised brands of oil are Scalecide, made by the B. G. Pratt Co., New York City; Target Brand Scale Destroyer, sold by the American Horticultural Distributing Company, Martinsburg, West Virginia; and Kil-O-Scale, sold by Griffith & Turner, Baltimore, Marylard. The first two named substances sell for 50 cents per gallon by the barrel; $1.00 per single gallon. The third sells for $1.00 per gallon by the barrel; $1.50 per single gallon.

Continuing the experimental work with Scalecide recorded in Bulletin 169, about the middle of December, 1905, we sprayed a block of 30 bearing peach trees in the orchard of Mr. G. W. Sloan, Port Clinton, O., 1 gallon of oil to 19 of water. On the same date, 11 peach trees were sprayed with Scalecide, 1 gallon in 39 gallons of water, to which was added 3 pounds of copper sulfate to every 50 gallons of diluted spray. Four other trees were sprayed with the same mixture as the last 11, but the south sides only of the trees were treated, the north sides being left as unsprayed checks.

April 10, 1906, in this same orchard, 87 peach trees, 4 plums and 1 pear were likewise treated with Scalecide, 1 gallon in 19 gallons of water. The trees, which were not more than 10 or 12 feet high, were thoroughly covered with spray, about three gallons per tree being used. Cost of materials, therefore, was about 15 cents

per tree, if purchased by the gallon, or half that amount if purchased by the barrel. The application was made in the evening of a cloudy day. Two check trees were left unsprayed. Surrounding this block on three sides, were trees which had been thoroughly sprayed with the lime-sulfur wash. Part of the lime-sulfur work was done when the writer was present and, while the work was not directed by him, it was in all respects as satisfactory as if done under his supervision. At some distance were 15 or 20 trees which Mr. Sloan had sprayed in this same spring with Target Brand Scale Destroyer. Judging from all the spraying work we saw done in his orchard, we are sure there was no fault in Mr. Sloan's method of application or in the thoroughness of the work. He reported that this insecticide went into solution in water very imperfectly, and that the more he churned for the purpose of dissolving it, the more "butter" he obtained.

An inspection of this orchard, made June 27, 1906, revealed that the scale was hatching in large numbers on the oil-sprayed trees as compared with those treated with the lime-sulfur wash. At this date results were very unpromising for the Scalecide and Target Brand treatments. The fall-sprayed trees had set a very small crop of fruit, and the spring-sprayed ones had set a much smaller crop than the ones treated with lime-sulfur, though enough remained to give as large a crop as the trees could mature to best advantage. The plum trees were badly shocked, a few large branches died, and the entire season was required for the trees to regain their normal vigor; indeed it is not certain that they have yet fully recovered. The trees treated with Target Brand were hatching a little larger proportion of scales than those treated with Scalecide, but the trees apparently had been slightly worse infested when treatment was given.

Oct. 15th, a second inspection was made of this orchard. The fall-sprayed block of 30 trees had yielded only two or three bushels of fruit, or about the quantity a single tree should have yielded. The yield from the spring-sprayed trees had been satisfactory. So far as infestation was concerned, all the trees, both spring and fall treated, if given a 5 percent treatment (1 gallon Scalecide to 19 gallons of water) were as clean of scale as the trees treated with lime-sulfur, and possibly were slightly cleaner. The trees treated with 1 gallon Scalecide to 39 of water were not so clean as their better sprayed neighbors, and the check trees were much more scaly than any of the treated ones. The few trees that were

sprayed on one side only with the weakest treatment of Scalecide. furnished unmistakable evidence, from the contrasting degrees of infestation on the treated and untreated sides, that even a weak spraying is much better than none. The trees that were treated with Target Brand were in the worst condition of any trees in the orchard.

In a second orchard, that of Mr. F. L. Wilbur, of Medina, on March 29 and 31, 1906, we applied Scalecide to a miscellaneous lot of trees, consisting of 10 cherry, 22 apple, 5 peach, 7 plum and 27 pear. March 29 was cloudy, rainy and cold. A snow storm came on the 30th, and on the 31 we were obliged to sweep the snow from the trunks and larger limbs with a broom to put them in condition to receive the spray. In the afternoon, when the spraying was done, the wind was high and, though the sun was shining, the mercury hovered close to the freezing point. It would have been almost impossible to spray with lime-sulfur under the same conditions. The liquid had to be used very liberally against such a strong wind to insure a coating on every part of every twig. There was a marked tendency for the liquid to run on the large limbs and down the trunk, where used so freely.

June 21st, this orchard was inspected, and conditions very similar to those already reported for the Port Clinton orchard were found, so far as infestation was concerned. Young scales were hatching much more freely than on trees beside them treated with lime-sulfur. However, no injury was discoverable to either trees or fruit crop. October 3d, a second inspection showed that the trees were in as good condition as those sprayed with lime-sulfur and the fruit seemed less scaly. When treated the oil-sprayed trees were, perhaps, worse infested, on the average, than the lime-sulfur sprayed ones. We were not present when Mr. Wilbur made the lime-sulfur application. No injury to either trees or crop in this orchard was perceptible at any time during the season. These oils, when applied to peach, appeared to have a distinct fungicidal value, whether or not equal to that of lime-sulfur, we cannot judge.

Some of the Experiment Stations in other states have obtained best results with Target Brand, some with Scalecide and others with Kil-O-Scale. Sometimes the results have been thought to be as good or better than those obtained with lime-sulfur; again the treatments were total failures, the condition of the

treated trees being as bad or worse than that of the untreated checks. It seems evident that these oils either vary in composition, or else there are some unknown factors governing plant physiology, or residing in weather conditions or something else, which renders results with them more uncertain than with lime-sulfur.

When safety, cost and efficiency are all considered, we believe lime-sulfur is the best remedy for the orchardist to use. It can be used very liberally with little or no danger to the trees and, by its color, indicates within a few hours whether the spraying was thoroughly done. Since thoroughness of application is the key to success or failure in treating San Jose scale, we regard the presence of a marker in the spray of the greatest importance. But even if this deficiency of oils is remedied, there is evidently a danger limit to the quantity we can use, beyond which we dare not pass without risk to both trees and crops. On the other hand, the soluble oils are quickly prepared, work smoothly in pumps and nozzles, are not corroding on the skin like lime-sulfur, and can be applied in colder weather. They will probably prove of value to the man with a few trees, and may have a wider possibility of usefulness on old, rough-barked trees, such as apple. For general use, it is impossible to recommend them so highly as lime-sulfur, until they have been widely tried in the hands of the fruit-growers. Station officials, purchasing their supplies in small lots direct from the manufacturers, and using them in small tests, cannot always forecast, even paproximately, the results that will be obtained from numerous tests under varying conditions, made over a wide territory.

Our thanks are due to the owners of the orchards before-named for their cheerful co-operation and other courtesies. The fall treatment of oil was made by Mr. J. S. Houser, Asst. Entomologist.